



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: <b>PCT/US97/00720</b></p> <p>(22) International Filing Date: 16 January 1997 (16.01.97)</p> <p>(30) Priority Data: 60/010,042 16 January 1996 (16.01.96) US</p> <p>(71) Applicant (for all designated States except US): AVERY DENNISON CORPORATION [US/US]; 150 North Orange Grove Boulevard, Pasadena, CA 91103 (US).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): AVALON, Gary, A. [US/US]; 2471 Larchview Drive, Painesville, OH 44077 (US). HARTMAN, William, G. [US/US]; 10135 Foxwood, North Royalton, OH 44133 (US). HILSTON, Michael, D. [US/US]; 13760 Seeley Road, Painesville, OH 44077 (US). SPILIZEWSKI, Karen, L. [US/US]; 91 East 226th Street, Euclid, OH 44123 (US). SAVAGE, David, L. [US/US]; 10444 Ravenwood Lane, Painesville, OH 44077 (US).</p> <p>(74) Agents: CORSO, Joseph, J. et al.; Pearne, Gordon, McCoy &amp; Granger, 1200 Leader Building, Cleveland, OH 44114 (US).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIGO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>	
<p>(54) Title: STRETCHABLE MECHANICAL/ADHESIVE CLOSURE FOR A DISPOSABLE DIAPER</p>			
<p>(57) Abstract</p> <p>This invention is a fastening system for securing a diaper having both mechanical and an adhesive or cohesive securing. Tab members (10) comprise a face stock layer (14), a contact layer (16) of adhesive or cohesive overlying at least a portion of the face stock layer (14), and mechanical fastening elements (18) projecting from at least a portion of the contact layer (16). The face stock layer includes extensible (14a) and substantially nonextensible polymeric portions (14b). A landing member (20) includes complementary mechanical fastening elements (20a).</p>			

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**STRETCHABLE MECHANICAL/ADHESIVE CLOSURE  
FOR A DISPOSABLE DIAPER**

This application is a continuation-in-part and claims the priority of US Provisional Application No. 60/010,042, filed January 16, 1996.

## BACKGROUND OF THE INVENTION AND RELATED ART

The present invention relates to closures and methods of making closures for fastening adjacent portions or edges of materials or components together. The closures are useful as fastening system closures for disposable diapers.

Diapers of this general type are widely used. A typical diaper construction comprises an absorbent pad or batt or the like enclosed in an outer plastic shell or a non-woven backsheet that is non-woven fabric laminated with a water impermeable layer such as a polyethylene film. A water permeable inner shell or liner is also provided to promote separation of fluid from the user.

The fastener tape system generally includes adhesive tabs fastened to one end of the diaper assembly construction at each lateral side of the diaper in a permanent "factory joint" by the diaper manufacturer using adhesives or other techniques. The tabs have a face coated with pressure-sensitive adhesive. The tabs are releasably attachable to the other end of the diaper at each lateral side in a "user joint". The attachment is releasable both to allow permanent removal of the diaper and to allow unfastening to inspect the diaper followed by refastening if indicated.

The user joint may be formed by direct connection of the tab to the diaper outer surface whether the latter is formed of a plastic film or a non-woven backsheets. In the case of plastic film shells, it is typical to provide a "landing zone" formed of reinforcing tape or the like

1 for receiving the end of the tab to form the user joint.  
2 The landing zone may provide a plastic surface or a non-  
3 woven surface and may comprise a knit type fabric landing  
4 pad.

5 The fastener tape system may rely solely upon  
6 pressure-sensitive adhesive in the formation of the user  
7 joint as shown in US Patents 4,795,456, 4,710,190,  
8 4,020,842 and 3,833,456. The use of combined adhesive  
9 and mechanical fastener systems is shown in US Patents  
10 5,019,065, 5,053,028 and 4,869,724. The teachings of all  
11 of these patents being incorporated herein by reference.

12 The use of extensible or stretchable tabs to promote  
13 user comfort through better fit and more secure mounting  
14 is also known in the art. The tabs operate as extensible  
15 diaper side waistbands. Examples of such diaper  
16 fastening systems are disclosed in US Patents 4,795,456,  
17 4,066,081, 4,051,853 and 3,800,796.

18 Related art includes US Patents 3,464,094,  
19 4,239,829, 5,250,253 and European Publication No.  
20 0 191 355.

21 SUMMARY OF THE INVENTION

22 The present invention provides an extensible tab  
23 fastener system having a user joint that enables combined  
24 mechanical and adhesive attachment. The mechanical and  
25 adhesive attachments each contribute to the total  
26 integrity or strength of the diaper closure or user  
27 joint, and neither has to be fully effective to provide  
28 the required total closure strength. The tab fastener  
29 system may be produced by high speed manufacturing  
30 processes including coextrusion.

31 In the illustrated embodiments, the fastening system  
32 tab members comprise a facestock layer, a contact  
33 securement portion comprising a layer of adhesive or  
34 cohesive overlying at least a portion of the facestock

1       layer, and mechanical fastening elements projecting from  
2       at least a portion of the contact layer. The tab contact  
3       securement portion extends over at least a portion of the  
4       extensible and substantially nonextensible polymeric  
5       portions of the facestock layer. A landing member  
6       includes complementary mechanical fastening elements and  
7       contact securement portion comprising a contact surface  
8       or cohesive for engagement with the tab adhesive or  
9       cohesive.

BRIEF DESCRIPTION OF THE DRAWINGS

11 Fig. 1 is a perspective view of a tab fastener of a  
12 tab fastener system in accordance with the invention;

13           Fig. 2 is a fragmentary perspective view on a  
14           reduced scale showing the tab fastener system of Fig. 1  
15           applied to a diaper with the tab in the deployed position  
16           ready for closure;

17                   Fig. 3 is a fragmentary schematic plan view showing  
18                   the process for making a tab fastener in accordance with  
19                   the invention; and

20 Fig. 4 is a perspective view similar to Fig. 1  
21 showing a tab fastener in accordance with another  
22 embodiment of the invention.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to Figs. 1 and 2, a diaper tab 10 for use in closure of a diaper 12 is shown. The diaper tab 10 includes a facestock film 14, an adhesive layer 16 and mechanical engagement or closure elements 18.

28           The facestock film 14 includes an extensible central  
29       portion 14a and nonextensible terminal portions 14b. The  
30       extensible portion 14a may be formed of elastomers such  
31       as the thermoplastic elastomers sold by the Shell  
32       Chemical Company under the designations Kraton. These  
33       elastomers may be SBS, SIS, SI, S(IS)<sub>x</sub> and SEBS block

1 copolymers and mixtures thereof. The nonextensible  
2 portions 14b of the film 14 may be formed of  
3 polypropylene, polyethylene and combinations of such  
4 polymers having suitable film forming characteristics.

5 The adhesive layer 16 may be formed of known  
6 adhesive materials such as a pressure-sensitive adhesives  
7 including acrylic resin and natural or synthetic based  
8 rubber adhesives. Preferred adhesives include hot melt  
9 pressure-sensitive adhesives of the A-B-A block copolymer  
10 type comprising an elastomeric B-block derived from  
11 isoprene and thermoplastic A-blocks derived from styrene  
12 as disclosed in US Patent 3,932,328. Illustrative rubber  
13 based adhesives include styrene-isoprene-styrene and  
14 styrene-butadiene-styrene which may optionally contain  
15 diblock components such as styrene isoprene and styrene  
16 butadiene. The layer 16 may comprise a cohesive as  
17 taught in US Patent 5,085,655 to Mann, which patent is  
18 also owned by the assignee herein. The adhesives or  
19 cohesives may be applied using hot-melt, solvent or  
20 emulsion techniques. The adhesive or cohesive layer 16  
21 may extend along a portion of or substantially all of the  
22 adjacent surface of the layer 14.

23 The mechanical elements 18 are integrally formed  
24 with the facestock film 14 in the illustrated embodiment.  
25 However, the elements 18 may be separately formed and  
26 attached to the surface of the facestock. The elements  
27 18 extend generally perpendicular from the facestock film  
28 14 and project through the adhesive layer 16. The  
29 protuberances provided by the projecting or exposed ends  
30 of the elements 18 should be of sufficient length to  
31 provide mechanical engagement with a locking or engaging  
32 array of mechanical elements, or with a fibrous material  
33 such as a non-woven landing tape or member 20 having  
34 fibers 20a as shown in Fig. 2 or a non-woven backsheet of  
35 a diaper. Further, the polymer forming the nonextensible

1 portions 14b and the elements 18 should be of sufficient  
2 stiffness to provide the required shear strength  
3 engagement. It is preferred to dispose the elements 18  
4 along only the nonextensible portions 14b since is  
5 believed to enhance the shear resistance by limiting  
6 tendency of the elements 18 to be laterally displaced.

7 The pressure-sensitive adhesive is relatively more  
8 extensible or stretchable than other adjacent layers, and  
9 the tab 10 has overall extensibility characteristics  
10 substantially corresponding with the facestock film 14.  
11 That is, the tab 10 includes a central elastic portion  
12 10a corresponding with the location of the film portion  
13 14a and nonextensible terminal portions 10b corresponding  
14 with the locations of film portions 14b. As shown, each  
15 of the portions 14a and 14b extend across the width of  
16 the tab 10 at spaced locations along the length of the  
17 tab extending between the end portions of the diaper to  
18 be joined.

19 Referring to Fig. 2, one of the terminal portions  
20 10b of the tab 10 is secured to the diaper 12 at a  
21 factory joint at one of the lateral sides at one end of  
22 the diaper 12. The other terminal portion 10b is  
23 deployable to form a user joint with the landing tape 20  
24 to close the diaper about a wearer such as an infant. It  
25 should be appreciated that the tab 10 may be provided  
26 with nonextensible facestock portions adjacent each end  
27 thereof to facilitate the provision of the factory joint  
28 with the diaper at one end and the manipulation of the  
29 tab to form the user joint at the other end.

30 The tab 10 and the landing member 20 provide a  
31 fastener system having both mechanical and adhesive  
32 engagement. During use, the mechanical elements 18  
33 particularly provide shear strength and the pressure-  
34 sensitive adhesive layer particularly provides tack  
35 strength. This may be achieved with the adhesive bond

1 between the pressure-sensitive adhesive layer 16 and the  
2 fibrous surface of the landing member 20. If the layer  
3 16 is a cohesive, then the landing member 20 must also  
4 include the cohesive as a coating having the fibers 20a  
5 extending therethrough, discrete cohesive particles  
6 carried by the fibers 20a or as a separate cohesive area.

7 Referring to Fig. 3, a coextrusion die 22 extrudes  
8 the facestock film 14 as a side-by-side coextrusion  
9 including adjacent portions of extensible polymer film  
10 14a and nonextensible polymer film 14b. For convenience,  
11 the film 14 is shown to include a limited number of  
12 adjacent extensible and nonextensible film portions,  
13 however, a much larger number of such portions may be  
14 provided along the width or cross direction of the film  
15 14.

16 The film 14 upon exiting the die 10 engages a  
17 molding-casting roll 24 for purposes of further shaping  
18 the film. In this instance, the roll 24 cooperates with  
19 the die 10 to form mechanical engagement elements 18 at  
20 least along the nonextensible film portions 14b. The  
21 elements 18 may have a variety shapes such as hooks or  
22 mushrooms as are well known in the art. Fibrous hook and  
23 loop engagement elements are preferred.

24 The coextrusion processing requires a matching or  
25 near matching of the melt flow characteristics of the  
26 plastic materials forming the portions 14a and 14b. Such  
27 matching and processing techniques are known in the art  
28 and illustrated, for example, in US Patent 3,800,796.

29 The adhesive layer 16 is applied to the facestock  
30 film 14 along the surface having the elements 18  
31 extending therefrom. As indicated above, the thickness  
32 of the adhesive layer 16 assures a sufficient projection  
33 of the elements 18 to effect mechanical engagement. The  
34 adhesive may be applied at the time of the manufacture of  
35 the film 14 or at a later time and, in either case, known

1 techniques may be used with regulation of thickness to  
2 assure projection of elements 18. An adhesive coating  
3 roll 26 is shown in Fig. 3 applying the adhesive layer 16  
4 to the film 14.

5 As shown by the dotted outline in Fig. 4, the film  
6 14 having the adhesive layer 16 applied thereto is  
7 subsequently cut in the cross direction, as by a diaper  
8 manufacturer, to provide tabs 10. Each of tabs 10 has a  
9 central extensible portion 10a and nonextensible terminal  
10 portions 10b as described above. For convenience of  
11 illustration, the film 14 is shown to correspond in width  
12 with three tabs 10. In practice, the film 14 may have a  
13 width corresponding with a much larger number of tabs.

14 Referring to Fig. 4, a tab 30 includes a facestock  
15 layer 32, an adhesive layer 34 and mechanical engagement  
16 elements 36. In the tab 30, a plurality of extensible  
17 portions 32a are provided along the length of the tab.  
18 As compared with the tab 10, the tab 30 is similarly  
19 extensible, but it does not have a single central  
20 extensible portion. Further, the elements 36 in the tab  
21 30 are located along the entire surface of the adhesive  
22 layer 34. However, the elements 36 may be positioned  
23 along only the nonextensible portions 32b in a similar  
24 manner as in the above described embodiment.

25 While the invention has been shown and described with  
26 respect to particular embodiments thereof, this is for the  
27 purpose of illustration rather than limitation, and other  
28 variations and modifications of the specific embodiments  
29 herein shown and described will be apparent to those  
30 skilled in the art all within the intended spirit and scope  
31 of the invention. Accordingly, the patent is not to be  
32 limited in scope and effect to the specific embodiments  
33 herein shown and described nor in any other way that is  
34 inconsistent with the extent to which the progress in the  
35 art has been advanced by the invention.

WHAT IS CLAIMED IS:

1        1. A fastening system for releasably securing first  
2        and second components together, said fastening system  
3        including tab and landing members respectively mounted to  
4        said first and second components, said tab member  
5        comprising a facestock layer, first contact securement  
6        means comprising a first contact layer overlying at least  
7        a portion of said facestock layer, and first mechanical  
8        fastening elements projecting from at least a portion of  
9        said first contact layer, said facestock layer including  
10       extensible and substantially nonextensible polymeric  
11       portions, said tab having extensibility characteristics  
12       substantially corresponding with those of the facestock  
13       layer, said landing member including second mechanical  
14       fastening elements for mechanical interengagement with said  
15       first mechanical fastening elements and second contact  
16       securement means for contact securement with said first  
17       contact layer.

1        2. A fastening system as in claim 1, wherein said  
2        facestock layer including said extensible and substantially  
3        nonextensible portions is coextruded.

1        3. A fastening system as in claim 1, wherein said  
2        first contact layer overlies at least portions of said  
3        extensible and substantially nonextensible portions of said  
4        facestock layer.

1        4. A fastening system as in claim 1, wherein said  
2        first mechanical fastening elements project from said first  
3        contact layer overlying said nonextensible portion of said  
4        facestock layer only.

1           5. A fastening system as in claim 1, wherein said  
2           first and second mechanical fastening elements respectively  
3           comprise hook and loop portions.

1           6. A fastening system as in claim 5, wherein said  
2           fibers also provide said second contact securement means.

1           7. A fastening system as in claim 1, wherein said  
2           first contact layer is a layer of pressure-sensitive  
3           adhesive.

1           8. A fastening system as in claim 1, wherein said  
2           first contact layer is a layer of cohesive.

1           9. A fastening system as in claim 8, wherein said  
2           second contact securement means comprises a second layer of  
3           cohesive.

1           10. A fastening system for releasably securing a  
2           diaper closed about a user includes tab and landing members  
3           respectively mounted to opposite ends of said diaper, each  
4           of said tab members comprising a facestock layer, first  
5           contact securement means comprising a first contact layer  
6           overlying at least a portion of said facestock layer, and  
7           first mechanical fastening elements projecting from at  
8           least a portion of said first contact layer, said facestock  
9           layer including extensible and substantially nonextensible  
10           polymeric portions, said tab having extensibility  
11           characteristics substantially corresponding with those of  
12           the facestock layer, said first contact layer overlying at  
13           least portions of said polymeric portions of said facestock  
14           layer, said landing member including second mechanical  
15           fastening elements for mechanical interengagement with said  
16           first mechanical fastening elements and second contact

17       securement means for contact securement with said first  
18       contact layer.

1           11. A diaper as in claim 10, wherein said facestock  
2       layer including said extensible and substantially  
3       nonextensible portions is coextruded.

1           12. A fastening system as in claim 10, wherein said  
2       landing member comprises a fibrous fabric having fibers  
3       providing said second mechanical fastening elements.

1           13. A fastening system as in claim 12, wherein said  
2       fibers also provide said second contact securement means.

1           14. A fastening system as in claim 13, wherein said  
2       first contact layer is a layer of pressure-sensitive  
3       adhesive.

1           15. A fastening system as in claim 10, wherein said  
2       first contact layer is a layer of cohesive, said second  
3       contact securement means comprises a second layer of  
4       cohesive, said first and second contact layers being  
5       adapted to engage upon when said fastening system secures  
6       said diaper about a user.

1           16. A fastening system as in claim 10, wherein said  
2       tab member has a length and a width, said tab member  
3       extending along its length to releasably close said diaper,  
4       and said polymeric portions extend substantially across the  
5       width of said tab member at spaced locations along the  
6       length thereof.

1           17. A method of making a fastening system for  
2           releasably securing first and second components together,  
3           said fastening system including tab and landing members  
4           respectively mounted to said first and second components,  
5           comprising the steps of:

6           providing a laminate for forming said tab member by  
7           coextruding a facestock layer including extensible and  
8           substantially nonextensible polymeric portions, applying a  
9           first contact layer over at least a portion of said  
10           facestock layer, and providing first mechanical fastening  
11           elements projecting from at least a portion of said first  
12           contact layer, cutting said laminate to form said tab  
13           member with a length and a width such that said polymeric  
14           portions extend substantially across the width of said tab  
15           member at spaced locations along the length thereof, said  
16           tab member having extensibility characteristics  
17           substantially corresponding with those of the facestock  
18           layer,

19           providing said landing member including second  
20           mechanical fastening elements for mechanical  
21           interengagement with said first mechanical fastening  
22           elements and second contact securement means for contact  
23           securement with said first contact layer, and

24           mounting said tab and landing members to said first  
25           and second components.

1           18. A method as in claim 17, wherein said landing  
2           member comprises a fibrous fabric having fibers providing  
3           said second mechanical fastening elements.

1           19. A fastening system as in claim 18, wherein said  
2           fibers also provide said second contact securement means  
3           and said first contact layer is a layer of pressure-  
4           sensitive adhesive.

1           20. A fastening system as in claim 18, wherein said  
2 first contact layer is a layer of cohesive and said second  
3 contact securement means comprises a second layer of  
4 cohesive.

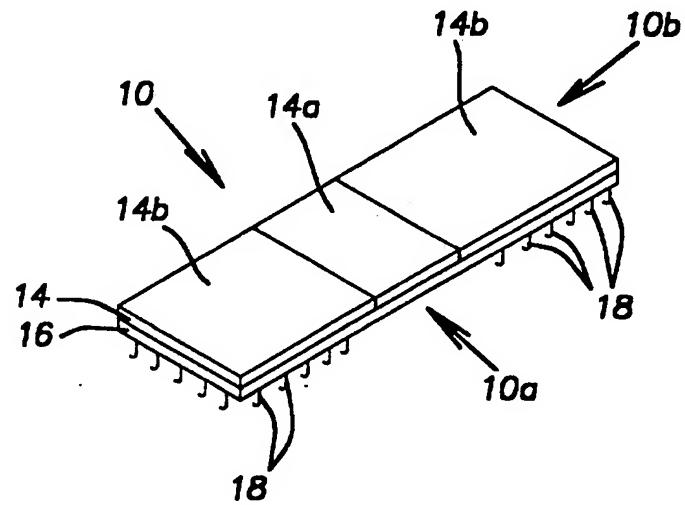
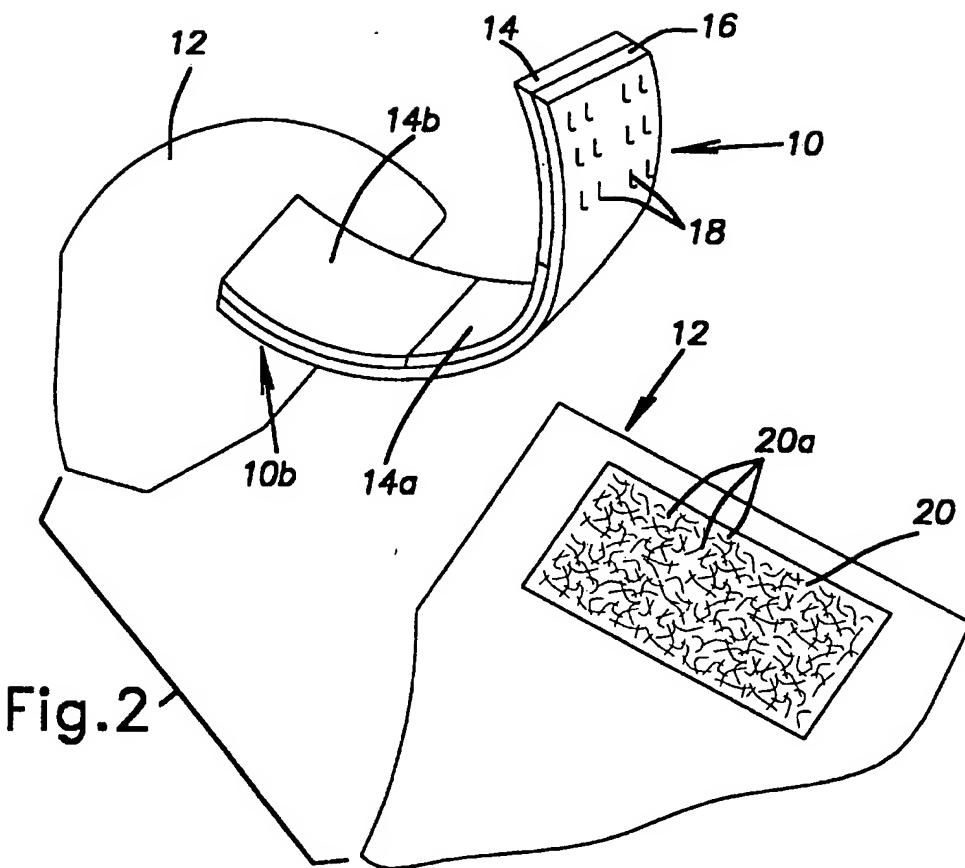


Fig. 1

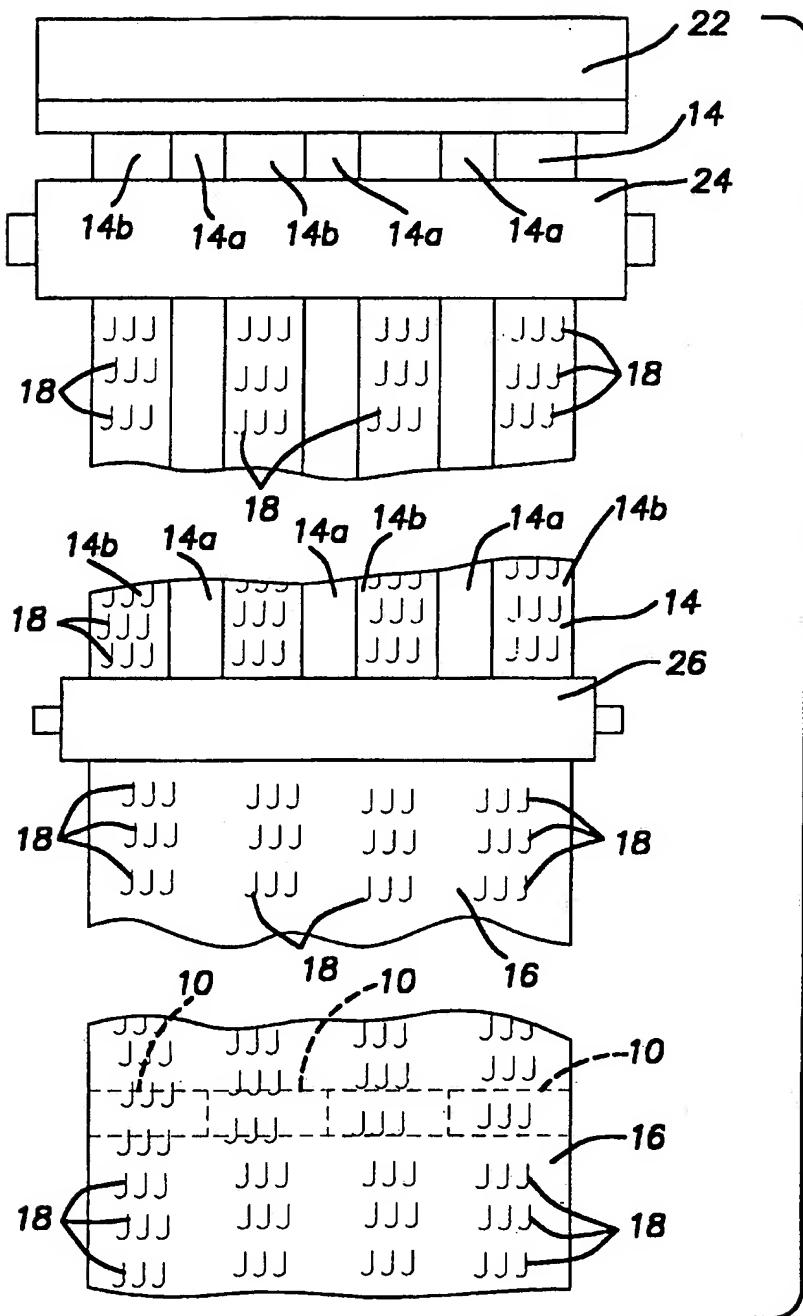


Fig.3

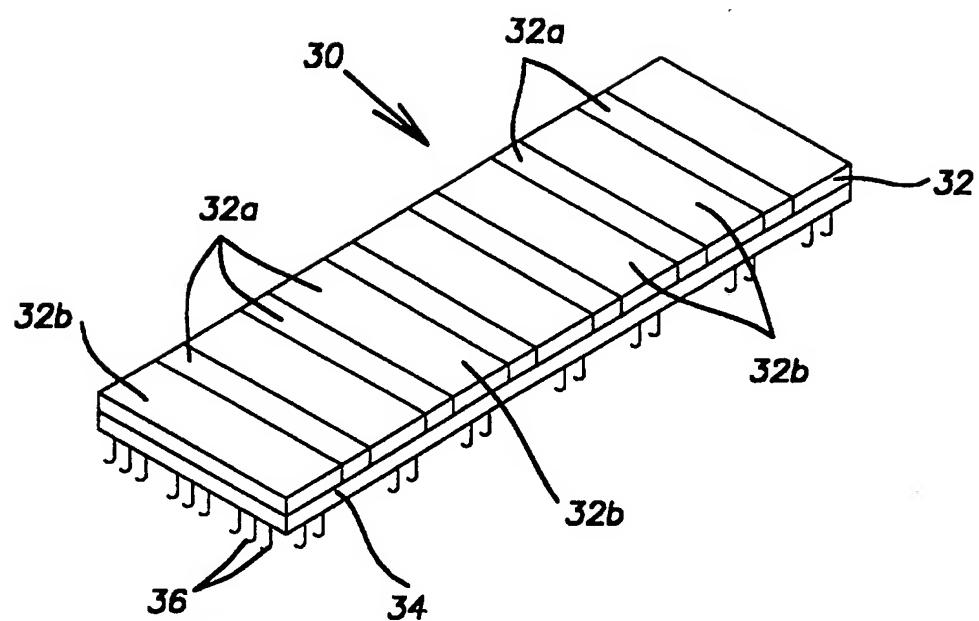


Fig.4

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US97/00720

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A44B 01/04; A61F 13/15  
 US CL :24/306; 604/389

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 24/304, 306; 604/385.1, 386, 387, 389-391

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,053,028 A (ZOIA et al) 01 October 1991, Abstract, and Figs. 1-15.	1-20
X	US 5,279,604 A (ROBERTSON et al) 18 January 1994, Abstract.	1-20
X,P	US 5,549,591 A (LANDVOGT) 27 August 1996, Figs. 1 and 2, and Abstract.	1-20

Further documents are listed in the continuation of Box C.

See patent family annex.

Special categories of cited documents:	
"A"	document defining the general state of the art which is not considered to be of particular relevance
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"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search

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